Docket No. 0756-2218

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	)	Art Unit: 2829
Hongyong ZHANG et al.	)	Examiner: E. Pert
Serial No. 09/695,414	)	
Filed: October 25, 2000	)	
For: METHOD FOR FORMING	)	
SEMICONDUCTOR DEVICE	)	
	)	

CERTIFICATE OF MAILING

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Adele M Stamper

PETITION TO WITHDRAW HOLDING OF ABANDONMENT AND RESPONSE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicant's representative received a *Notice of Abandonment* from the U.S. Patent Office mailed December 23, 2003 in the above-identified application. The *Notice of Abandonment* was issued because "Applicant seemingly failed to file an Appeal Brief within 2 months following the "Notice of Appeal" filed 6-25-03." On December 31, 2003, Applicant filed a *Response to Notice of Abandonment,* requesting that the holding of abandonment be withdrawn in that an *Appeal Brief* was timely filed as noted.

In response to the *Notice of Appeal* dated June 25, 2003, an Appeal Brief was filed on August 25, 2003. Enclosed please find a copy of the PTO stamped receipt card evidencing receipt of the Brief and a copy of canceled Check No. 2324 in the amount of $320.00 were previously provided and a further copy is submitted herewith. In accordance with discussions with Examiner Pert, it is now understood that Applicant must formally petition to withdraw the holding of abandonment and requests that this be treated as such petition. As the issuance of the *Notice of Abandonment* was a Patent Office error in the first instance, no fee is believed to be due. However, any necessary fees can be charge to Deposit Account No. 50-2280.

In view of the above and the enclosed document, it is believed that the *Notice of Abandonment* was issued in error. Therefore, it is respectfully requested that the *Notice*

of Abandonment be rescinded. Should a further copy of the Brief be required, it is requested that the undersigned be contacted to coordinate such submission.

Respectfully submitted,

Eric J. Robinson
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MEMO 0756-2218; SN 09/695,414

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This will acknowledge receipt of the following:

1. Transmittal Form/Fee Transmittal (2 copies)
2. Appeal Brief (in triplicate)
3. Check No. 2324 in the amount of $320.00 (appeal brief)
4. Certificates of Mailing for each of the above

In re PATENT application of:

HONGYONG ZHANG et al
Serial No. 09/695,414
Filed: 10/25/2000
Due Date: 08/24/2003
For: METHOD FOR FORMING SEMICONDUCTOR DEVICE
Docket: 0756-2218
August 25, 2003
EJR/EJR/ams

SEP - 8 2003

9/3/03

PTO/SB/21 (08-00)

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Total Number of Pages in This Submission	

Application Number	09/695,414
Filing Date	October 25, 2000
First Named Inventor	Hongyong ZHANG et al.
Group Art Unit	2829
Examiner Name	E. Pert
Attorney Docket Number	0756-2218

ENCLOSURES *(check all that apply)*

- ☒ Fee Transmittal Form
  - ☒ Fee Attached
- ☐ Amendment / Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
- ☐ Response to Missing Parts/ Incomplete Application
  - ☐ Response to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Assignment Papers *(for an Application)*
- ☐ Drawing(s)
- ☐ Declaration and Power of Attorney
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert to a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s) _____
- ☐ After Allowance Communication to Group
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☒ Appeal Communication to Group *(Appeal Notice, Brief, Reply Brief)*
- ☐ Proprietary Information
- ☐ Status Letter
- ☐ Other Enclosures
  1.
  2.
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  6.

Remarks

☒ The Commissioner is hereby authorized to charge any additional fees required or credit any overpayments to Deposit Account No. 50-2280 for the above identified docket number.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Eric J. Robinson, Reg. No. 38,285 Robinson Intellectual Property Law Office, P.C. PMB 955 21010 Southbank Street Potomac Falls, VA 20165
Signature	
Date	August 25, 2003

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Signature	Adele M Stamper	Date	August 25, 2003

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PTO/SB/17 (11-00)
Approved for use through 10/31/2002. OMB 0651-0032

FEE TRANSMITTAL FOR FY 2003

Patent fees are subject to annual revision.

TOTAL AMOUNT OF PAYMENT ($) 320.00

Complete if Known	
Application Number	09/695,414
Filing Date	October 25, 2000
First Named Inventor	Hongyong ZHANG et al.
Examiner Name	E. Pert
Group Art Unit	2829
Attorney Docket No.	0756-2218

METHOD OF PAYMENT

1. ☐ The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:

Deposit Account Number: 50-2280

Deposit Account Name: Robinson Intellectual Property Law Office

☒ Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17 and credit overpayments

☐ Applicant claims small entity status. See 37 CFR 1.27

2. ☒ **Payment Enclosed:**

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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
101	750	201	375	Utility filing fee	
106	330	206	165	Design filing fee	
107	520	207	260	Plant filing fee	
108	750	208	375	Reissue filing fee	
114	160	214	80	Provisional filing fee	

SUBTOTAL (1) ($)

2. EXTRA CLAIM FEES

	Extra Claims		Fee from below		Fee Paid
Total Claims		-20** =		X =	
Independent Claims		-3** =		X =	
Multiple Dependent				=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
103	18	203	9	Claims in excess of 20
102	84	202	42	Independent claims in excess of 3
104	280	204	140	Multiple dependent claim, if not paid
109	84	209	42	** Reissue independent claims over original patent
110	18	210	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($)

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
105	130	205	65	Surcharge – late filing fee or oath	
127	50	227	25	Surcharge – late provisional filing fee or cover sheet	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for *ex parte* reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within first month	
116	410	200	205	Extension for reply within second month	
117	930	460	465	Extension for reply within third month	
118	1,450	720	725	Extension for reply within fourth month	
128	1,970	228	985	Extension for reply within fifth month	
119	320	219	160	Notice of Appeal	
120	320	220	160	Filing a brief in support of an appeal	$320.00
121	280	221	140	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive – unavoidable	
141	1,280	241	640	Petition to revive – unintentional	
142	1,280	242	640	Utility issue fee (or reissue)	
143	460	243	230	Design issue fee	
144	620	244	310	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Processing fee under 37 CR 1.17(q)	
126	180	126	180	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	
146	740	246	370	Filing a submission after final rejection (37 CFR § 1.129(a))	
149	740	249	370	For each additional invention to be examined (37 CFR § 1.29(b))	
179	750	279	375	Request for Continued Examination (RCE)	
169	900	169	900	Request for expedited examination of a design application	

Other fee (specify) _____

* Reduced by Basic Filing Fee Paid SUBTOTAL (3) ($) 320.00

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SUBMITTED BY

Complete *(if applicable)*

Name *(Print/Type)*	Eric J. Robinson	Registration No. *(Attorney/Agent)*	38,285	Telephone	(571) 434-6789
Signature				Date	August 25, 2003

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:) Group Art Unit: 2829

Hongyong ZHANG et al.) Examiner: E. Pert

Serial No. 09/695,414)

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For: METHOD OF FORMING)
SEMICONDUCTOR DEVICE)
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Adele M Stamper

APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the provisions of 35 U.S.C. § 134 and 37 C.F.R. § 1.192(a), Appellants submit this Appeal Brief in triplicate to appeal the examiner's final rejection of claims 1-18 in the Official Action mailed February 25, 2003 (Paper No. 15).

TABLE OF CONTENTS

I. REAL PARTY IN INTEREST

The named inventors have assigned all ownership rights in the pending application to Semiconductor Energy Laboratory Co., Ltd., 398, Hase, Atsugi-shi, Kanagawa-ken, 243-0036, Japan, which is the real party in interest.

II. RELATED APPEALS AND INTERFERENCES

The appellants, their legal representatives, and the assignee are not aware of any other pending appeals or interferences which will directly affect or be directly affected by, or have a bearing on the Board's decision in this appeal.

III. STATUS OF THE CLAIMS

Claims 1-18 are pending in the present application, of which claims 1, 4, 7, 10, 13 and 16 are independent. No claims have been deemed allowable by the examiner.

IV. STATUS OF AMENDMENTS

All prior amendments are believed to have been entered in the present application. Thus, the status of the claims in this application is as set forth above and in Appendix A.

V. SUMMARY OF THE INVENTION

The present invention relates to a method of manufacturing a semiconductor device comprising the steps of forming a semiconductor film comprising amorphous silicon (e.g., amorphous silicon film 13, Fig. 1B) on an insulating surface (e.g., silicon oxide film 12, Fig. 1A), forming a crystallization promoting material comprising a metal (e.g., nickel compound film 14, Fig. 1C) in contact with the semiconductor film in a chamber (e.g., chamber 101, Fig. 1E), and crystallizing the semiconductor film in contact with the crystallization promoting material in the chamber (e.g., crystallized silicon film 15, Fig. 1D). The step of crystallizing the semiconductor film is carried out successively after the formation of the crystallization promoting material without exposing the semiconductor film and the crystallization promoting material to the air outside the chamber. For example, a nickel compound film 14 and a crystallized silicon film 15 are formed successively in a chamber 101, and by controlling valves V1, V2 and V3, both processes

are conducted without exposing the chamber to air outside the chamber (page 9, ¶ 1-3, and the "second method" at pages 9-10). Stated differently, the step of forming the crystallization promoting material and the step of crystallizing the semiconductor film are conducted successively in a same chamber without exposing the semiconductor film and the crystallization promoting material to the air outside the chamber.

VI. STATEMENT OF ISSUES

Whether claims 1-18 are not *prima facie* obvious based on the combination of U.S. Patent No. 5,147,826 to Liu et al. and U.S. Patent No. 5,512,320 to Turner et al.

VII. GROUPING OF CLAIMS

The rejected claims shall stand or fall together.

VIII. ARGUMENTS

Whether claims 1-18 are not *prima facie* obvious based on the combination of U.S. Patent No. 5,147,826 to Liu et al. and U.S. Patent No. 5,512,320 to Turner et al.

Paragraph 1 of the *Official Action* mailed February 25, 2003 rejects claims 1-18 under 35 U.S.C. §103(a) as obvious based on the combination of U.S. Patent No. 5,147,826 to Liu et al. and U.S. Patent No. 5,512,320 to Turner et al. The Applicants respectfully traverse the rejection because the Official Action has not made a *prima facie* case of obviousness. As it is believed the independent claims are patentably distinguished from Liu and Turner, the dependent claims will not be separately argued and are believed to be allowable for the same reasons as the independent claims from which they depend.

As stated in MPEP §§ 2142-2143.01, to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art

reference (or references when combined) must teach or suggest all the claim limitations. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). See also In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). Also, MPEP § 2142 states that the examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. It is respectfully submitted that the Official Action has failed to carry this burden.

The prior art, either alone or in combination, does not teach or suggest all the features of the independent claims. Liu and Turner, either alone or in combination, do not teach or suggest that a step of crystallizing a semiconductor film is carried out successively in a chamber after formation of a crystallization promoting material in the chamber without exposing the semiconductor film and the crystallization promoting material to the air outside the chamber (independent claims 1, 7, 10 and 16). Also, Liu and Turner, either alone or in combination, do not teach or suggest that a step of forming a crystallization promoting material and a step of crystallizing a semiconductor film are conducted successively in a same chamber without exposing the semiconductor film and the crystallization promoting material to the air outside the chamber (independent claims 4 and 13).

Further, in forming the rejection, the Official Action relies upon no less than three allegations of inherency in the prior art. Each of these allegations of inherency will be discussed in detail below. The Applicants respectfully traverse that it is inherent that Liu has a chamber, particularly, a chamber for performing formation of a crystallization promoting material and crystallization of a semiconductor film in contact with the crystallization promoting material; or that either Liu or Turner inherently teach a method of manufacturing a semiconductor device comprising a step of crystallizing a

semiconductor film successively in a chamber after formation of a crystallization promoting material in the chamber without exposing the semiconductor film and the crystallization promoting material to the air outside the chamber.

Liu appears to teach thermally evaporating palladium or nickel onto an a-Si film, pattering using a shadow mask, and forming a crystallized pattern on the a-Si films using rapid thermal annealing (Example 2). However, Liu is completely silent as to what kind of apparatus is used to form this structure. The Official Action asserts that Liu "inherently utilizes 'a chamber' [Example 2]" (p. 2, Paper No. 15). The Applicants respectfully traverse the finding of inherency, because the Official Action has not provided a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic, i.e. a chamber for performing formation of a crystallization promoting material and crystallization of a semiconductor film in contact with the crystallization promoting material, necessarily flows from the teachings of the Liu reference. Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990). Furthermore, MPEP § 2112 makes clear that:

> The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. In re Rijckaert, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993) . . . "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" In re Robertson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) . . . . "In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original) . . . .

The Official Action offers no additional support for the assertion that Liu inherently utilizes a chamber, particularly a "chamber" as defined in the specification and drawings of the present invention, e.g. chamber 101 in Fig. 1E. Specifically, the Official Action offers no additional support for the assertion that Liu inherently utilizes a chamber in which a crystallization promoting material is formed in contact with a semiconductor film, in which the semiconductor film is crystallized, and in which these steps are performed without

exposing the semiconductor film and the crystallization promoting material to air outside the chamber. As such, the Applicants respectfully submit that Liu does not teach or suggest that a step of crystallizing a semiconductor film is carried out successively in a chamber after formation of a crystallization promoting material in the chamber without exposing the semiconductor film and the crystallization promoting material to the air outside the chamber, as is required by the independent claims of the present invention.

Although, the Official Action asserts that Liu inherently discloses a chamber, the Official Action concedes that Liu is "silent about the specifics of the chambers or chamber arrangements used for the proper practice of their methodology" and that Liu is "silent about the specifics of appropriate chamber arrangements for their 'depositing' and 'annealing'" (p. 3, Paper No. 15). The Official Action relies on Turner to cure the deficiencies in Liu. However, Turner does not cure the deficiencies in Liu. The Official Action relies on Turner to teach an apparatus with means for annealing deposited films and having improved throughput (Id.).

Liu and Turner, either alone or in combination, do not teach or suggest that a step of crystallizing a semiconductor film is carried out successively in a chamber after formation of a crystallization promoting material in the chamber without exposing the semiconductor film and the crystallization promoting material to the air outside the chamber. At best, Turner appears to teach "that multiple step processes can be performed in different chambers on a single substrate without removing the substrate from a vacuum environment" (col. 1, lines 49-51). This teaching is not the same as the present invention, which requires that a crystallization promoting material is formed in a chamber and a semiconductor film is crystallized in the chamber. Certainly, nothing in Turner teaches or suggests that a crystallization promoting material be formed in a chamber and that a semiconductor also be crystallized in that chamber. In fact, Turner does not teach or suggest anything related to crystallization, which makes it even more implausible to perform the Liu method using the Turner system. Even assuming proper motivation to combine the references could be found, performing the above-referenced functions in a Turner vacuum environment, presumably transfer chamber 12 of Turner, is not the same as performing those functions in a chamber of the present invention, e.g. chamber 101.

The Official Action asserts that "[it] would have been obvious at the time of applicant's claimed invention to adopt the chamber taught by Turner et al. for practicing the invention taught by Liu et al., to arrive at applicant's claimed invention, inherently (wherein the claimed 'not exposing' limitations are inherent to the 'improved throughput' apparatus taught by Turner et al.)" (p. 3, Paper No. 15). The Applicants respectfully traverse the finding of inherency. Specifically, the Applicants respectfully submit that the teaching in Turner related to improved throughput, namely using multiple processing chambers and a transfer chamber, is not equivalent and does not render inherent a method of manufacturing a semiconductor device comprising a step of crystallizing a semiconductor film successively in a chamber after formation of a crystallization promoting material in the chamber without exposing the semiconductor film and the crystallization promoting material to the air outside the chamber. Even if proper motivation to combine were found, nothing would instruct one with ordinary skill in the art to perform the Liu method in the device of the Turner apparatus. Since Turner does not discuss crystallization, it is not at all clear how or why one would perform crystallization in the Turner device without completely modifying the device. It does not appear that any of the individual steps in Turner are performed in any one chamber. Rather, it appears that each step is performed in either a heating chamber 28 or one of several processing chambers 40, 42, 44, 46. Therefore, there is no basis in fact and/or technical reasoning in Turner to reasonably support the determination that Turner inherently teaches a method of manufacturing a semiconductor device comprising a step of crystallizing a semiconductor film successively in a chamber after formation of a crystallization promoting material in the chamber without exposing the semiconductor film and the crystallization promoting material to the air outside the chamber. For at least these reasons, the Applicants respectfully traverse the above-referenced assertion of inherency in the Official Action.

Next, the Official Action asserts that "[upon] adopting Turner et al.'s chamber for performing the depositions of amorphous silicon and nickel in the invention of Liu et al., one would *inherently* 'successively form the crystallization promoting metal film after forming the amorphous silicon film without exposing to air outside the chamber' because the concept of 'without removing the substrate from a vacuum environment' taught by

Turner et al. is *equivalent* to 'without exposing the formed films on a substrate to air outside the chamber'" (p. 4, Paper No. 15, emphasis in original). First, as noted above, the Applicants respectfully submit that performing the above-referenced functions in a Turner vacuum environment, presumably transfer chamber 12 of Turner, is not the same as performing those functions in a chamber of the present invention, e.g. chamber 101.

Second, the Applicants respectfully traverse the finding of inherency, because the Official Action has not provided a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic, i.e. successively forming a crystallization promoting metal film after forming an amorphous silicon film without exposing both to air outside a chamber, necessarily flows from the teachings of the Liu and Turner references. See also MPEP § 2112. Even if one had motivation to combine the teachings of Liu and Turner, it still would not be inherent that a step of crystallizing a semiconductor film is carried out successively in a chamber after formation of a crystallization promoting material in the chamber without exposing the semiconductor film and the crystallization promoting material to the air outside the chamber. The above-referenced allegedly inherent characteristic is not the same as the present invention. Specifically, the Official Action states that it would be inherent to successively form the crystallization promoting metal film after forming the amorphous silicon film without exposing to air outside the chamber; however, the independent claims of the present invention recite either "wherein the step of crystallizing said semiconductor film is carried out successively after the formation of said crystallization promoting material without exposing said semiconductor film and said crystallization promoting material to the air outside said chamber," or "wherein the step of forming the crystallization promoting material and the step of crystallizing said semiconductor film are conducted successively in a same chamber without exposing said semiconductor film and said crystallization promoting material to the air outside said chamber." So, even if it could be proven that it is inherent to successively form the crystallization promoting metal film after forming the amorphous silicon film without exposing to air outside the chamber, that would not be enough to render obvious the present invention, which requires "without exposing said semiconductor film and said crystallization promoting material to the air outside said chamber." For reasons stated in greater

detail below, the Liu device teaches that crystallization is preferably performed in an oxygen atmosphere or ambient, not a vacuum chamber as discussed in Turner. Also, Turner does not discuss crystallization. There is not a basis in fact and/or technical reasoning to reasonably support the determination that Liu and Turner inherently teach that a step of crystallizing a semiconductor film is carried out successively in a chamber after formation of a crystallization promoting material in the chamber without exposing the semiconductor film and the crystallization promoting material to the air outside the chamber.

Therefore, Liu and Turner, either alone or in combination, do not teach or suggest that a step of crystallizing a semiconductor film is carried out successively in a chamber after formation of a crystallization promoting material in the chamber without exposing the semiconductor film and the crystallization promoting material to the air outside the chamber.

Further, Turner discloses a heating chamber 28 (apparently for pre-heating the glass substrates as described in column 4, lines 43-45) and separate processing chambers 40 (or 42, 44, 46) to deposit one or more thin layers. On the other hand, independent claims 4 and 13 recite a feature that the step of forming a crystallization promoting material and the step of crystallizing a semiconductor film are conducted successively in a same chamber. The feature of such formation in a same chamber is not disclosed even if proper motivation to combine Liu and Turner were identified.

Also, Turner teaches that a substrate is first heated and then a thin layer is deposited on the substrate (col. 4, in particular lines 41-53). This teaching in Turner differs from the present invention in that a crystallization promoting material is formed in a semiconductor film and the semiconductor film is crystallized.

Since Liu and Turner do not teach or suggest all the claim limitations, a *prima facie* case of obviousness cannot be maintained. Accordingly, reconsideration and withdrawal of the rejection under 35 U.S.C. § 103(a) are in order and respectfully requested.

Furthermore, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify Liu and Turner or to combine reference teachings to achieve the claimed invention. The Turner apparatus does not relate to the Liu process. The Official Action

argues that the Turner apparatus relates to the Liu process since the Turner apparatus is for depositing sequential thin films on glass substrates (p. 5, Paper No. 10). However, the Turner apparatus does not discuss crystallization. There is no teaching in either Liu or Turner to suggest modifying the Turner device to include the additional step of crystallization and to also suggest modifying the Liu method to perform all Liu method steps in a chamber that is not exposed to air. Even if one accepts that one would be motivated to perform the Liu method in the Turner apparatus in order to achieve "increased throughput" and a "cleaner system," there is still no motivation or teaching to modify the Turner apparatus to be suitable for crystallization.

In order to combine Liu and Turner to achieve the present invention, there would also have to be a teaching in the references that suggests removing the Liu crystallization step which, according to Liu, is preferably performed in an oxygen atmosphere or ambient. No such teaching exists in Liu or Turner, and if it did, the Liu method would no longer function properly.

The Examiner concedes that Liu does not teach or disclose "that the substrate under processing should not be exposed to air from the time the metal is deposited to the time the amorphous film is crystallized" (p. 3, ¶ 3, Paper No. 7). The Examiner contends that although Liu does not teach that a substrate under processing should not be exposed to air from the time a metal is deposited to the time an amorphous film is crystallized, that it would have been obvious to utilize the same tool or cluster and one of ordinary skill in the art would have been motivated to avoid exposing a substrate to air after nickel is formed, e.g., to prevent the nickel from oxidizing. The Examiner further contends that the Turner apparatus would allow higher through-put in practicing the invention of Liu and one of ordinary skill in the art, at the suggestion of Turner, would be motivated to combine multiple process steps in a single vacuum chamber, combining process steps for reduced floor space and higher through-put.

However, the Applicants respectfully submit that this rejection is not appropriate since there is no suggestion to combine Liu and Turner. If it would have been obvious to one with ordinary skill in the art to utilize the same tool or cluster, then the Liu method should not have exposed the substrate to air. The Examiner contends that the substrate is not exposed to air to prevent the nickel from oxidizing; however, Liu discloses that the

crystallization processes are performed in an oxygen atmosphere (col. 5, lines 58-63). The Applicants further submit that it is unclear whether the Examiner is correct in asserting that a nickel film is easily oxidized at a room temperature when exposed to the air. However, even assuming the Examiner is correct, it should be noted that Liu appears to expose the metal film to an oxidizing atmosphere (e.g., see col. 5, lines 58-60) and nevertheless, the metal film of Liu appears to function to promote crystallization.

The prior art fails to disclose or recognize any problem that occurs from exposing the semiconductor film and crystallization promoting material to air as recited in the present application. Absent any such disclosure or suggestion, it is respectfully submitted that one of skill in the art would not have been motivated to combine Liu and Turner to achieve the present invention since there is a lack of suggestion as to why a skilled artisan would use the proposed modifications to achieve the unobvious advantages first recognized by the Applicants. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. The Applicants respectfully submit that the combination and modifications proposed by the Official Action is not even suggested by the prior art references, much less shown to be desirable.

Even assuming motivation could be found, the Official Action has not given any indication that one with ordinary skill in the art at the time of the invention would have had a reasonable expectation of success when combining Liu and Turner. The Official Action argues that one with ordinary skill in the art would have had a reasonable expectation of success since "Turner et al. obviously teaches an apparatus useful to mass produce the glass substrate panels taught in the process of Liu et al., for display products" (Id.). This argument ignores the fact that Turner has nothing to do with crystallization and does not address the fact that Liu is preferably performed in an oxygen atmosphere.

In the present application, it is respectfully submitted that the prior art of record, alone or in combination, does not expressly or impliedly suggest the claimed invention and the Official Action has not presented a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.

Accordingly, reconsideration and withdrawal of the rejection of independent claims 1, 4, 7, 10, 13 and 16 under 35 U.S.C. § 103(a) is in order and respectfully requested. Likewise, it is believed that dependent claims 2, 3, 5, 6, 8, 9, 11, 12, 14, 15, 17 and 18 are allowable in that they depend from what is believed to be allowable base claims 1, 4, 7, 10, 13 and 16.

For all of the above reasons, it is respectfully asserted that the pending claims of the present application are unobvious in view of the prior art of record. Reversal of the outstanding rejections of record and allowance of the claims of this application is requested.

The present application is believed to be in condition for allowance and favorable reconsideration is respectfully requested. If the Examiner feels further discussions would expedite prosecution of this application, he is invited to contact the undersigned.

Respectfully submitted,

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IX. APPENDICES

A. Claims involved in the appeal.

B. U.S. Patent No. 5,147,826 to Liu et al.

C. U.S. Patent No. 5,512,320 to Turner et al.

APPENDIX A

PENDING CLAIMS

1. A method of manufacturing a semiconductor device comprising the steps of:

forming a semiconductor film comprising amorphous silicon on an insulating surface;

forming a crystallization promoting material comprising a metal in contact with said semiconductor film in a chamber; and

crystallizing said semiconductor film in contact with said crystallization promoting material in said chamber,

wherein the step of crystallizing said semiconductor film is carried out successively after the formation of said crystallization promoting material without exposing said semiconductor film and said crystallization promoting material to the air outside said chamber.

2. The method according to claim 1 wherein said metal is selected from the group consisting of Ni, Pd, Pt, Cu, Ag, Au, In, Sn, and Sb.

3. The method according to claim 1 further comprising a step of patterning the crystallized semiconductor film to form an active layer of a thin film transistor.

4. A method of manufacturing a semiconductor device comprising the steps of:

forming a semiconductor film comprising amorphous silicon on an insulating surface;

forming a crystallization promoting material comprising a metal in contact with said semiconductor film; and

crystallizing said semiconductor film by heating said semiconductor film;

wherein the step of forming the crystallization promoting material and the step of crystallizing said semiconductor film are conducted successively in a same

chamber without exposing said semiconductor film and said crystallization promoting material to the air outside said chamber.

5. The method according to claim 4 wherein said metal is selected from the group consisting of Ni, Pd, Pt, Cu, Ag, Au, In, Sn, and Sb.

6. The method according to claim 4 further comprising a step of patterning the crystallized semiconductor film to form an active layer of a thin film transistor.

7. A method of manufacturing a semiconductor device comprising the steps of:

forming a semiconductor film comprising amorphous silicon on an insulating surface;

forming a crystallization promoting material comprising a metal in contact with said semiconductor film by using a vapor of a gas containing said metal in a chamber; and

crystallizing said semiconductor film in contact with said crystallization promoting material in said chamber,

wherein the step of crystallizing said semiconductor film is carried out successively after the formation of said crystallization promoting material without exposing said semiconductor film and said crystallization promoting material to the air outside the chamber.

8. The method according to claim 7 wherein said metal is selected from the group consisting of Ni, Pd, Pt, Cu, Ag, Au, In, Sn, and Sb.

9. The method according to claim 7 further comprising a step of patterning the crystallized semiconductor film to form an active layer of a thin film transistor.

10. A method of manufacturing a semiconductor device comprising the steps of:

forming a semiconductor film comprising amorphous silicon on an insulating surface;

forming a crystallization promoting material comprising a metal in contact with a selected portion of said semiconductor film in a chamber; and

crystallizing said semiconductor film in contact with said crystallization promoting material in said chamber,

wherein the step of crystallizing said semiconductor film is carried out successively after the formation of said crystallization promoting material without exposing said semiconductor film and said crystallization promoting material to the air outside said chamber.

11. The method according to claim 10 wherein said metal is selected from the group consisting of Ni, Pd, Pt, Cu, Ag, Au, In, Sn, and Sb.

12. The method according to claim 10 further comprising a step of patterning the crystallized semiconductor film to form an active layer of a thin film transistor.

13. A method of manufacturing a semiconductor device comprising the steps of:

forming a semiconductor film comprising amorphous silicon on an insulating surface;

forming a crystallization promoting material comprising a metal in contact with a selected portion of said semiconductor film; and

crystallizing said semiconductor film by heating said semiconductor film;

wherein the step of forming the crystallization promoting material and the step of crystallizing said semiconductor film are conducted successively in a same chamber without exposing said semiconductor film and said crystallization promoting material to the air outside said chamber.

14. The method according to claim 13 wherein said metal is selected from the group consisting of Ni, Pd, Pt, Cu, Ag, Au, In, Sn, and Sb.

15. The method according to claim 13 further comprising a step of patterning the crystallized semiconductor film to form an active layer of a thin film transistor.

16. A method of manufacturing a semiconductor device comprising the steps of:

forming a semiconductor film comprising amorphous silicon on an insulating surface;

forming a crystallization promoting material comprising a metal in contact with a selected portion of said semiconductor film by using a vapor of a gas containing said metal in a chamber; and

crystallizing said semiconductor film in contact with said crystallization promoting material in said chamber,

wherein the step of crystallizing said semiconductor film is carried out successively after the formation of said crystallization promoting material without exposing said semiconductor film and said crystallization promoting material to the air outside said chamber.

17. The method according to claim 16 wherein said metal is selected from the group consisting of Ni, Pd, Pt, Cu, Ag, Au, In, Sn, and Sb.

18. The method according to claim 16 further comprising a step of patterning the crystallized semiconductor film to form an active layer of a thin film transistor.